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Auctions in Display Ads

Bidding perspective

Ads Data Science Summit Q2

ajaybangla@ GTrade

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Team Introduction (Display Ads -> gTrade)

- gTrade: Team in display ads responsible for managing display ad ecosystem dynamics (interface between advertisers and external publishers)
- Comprises of data scientists, software engineers, product manager



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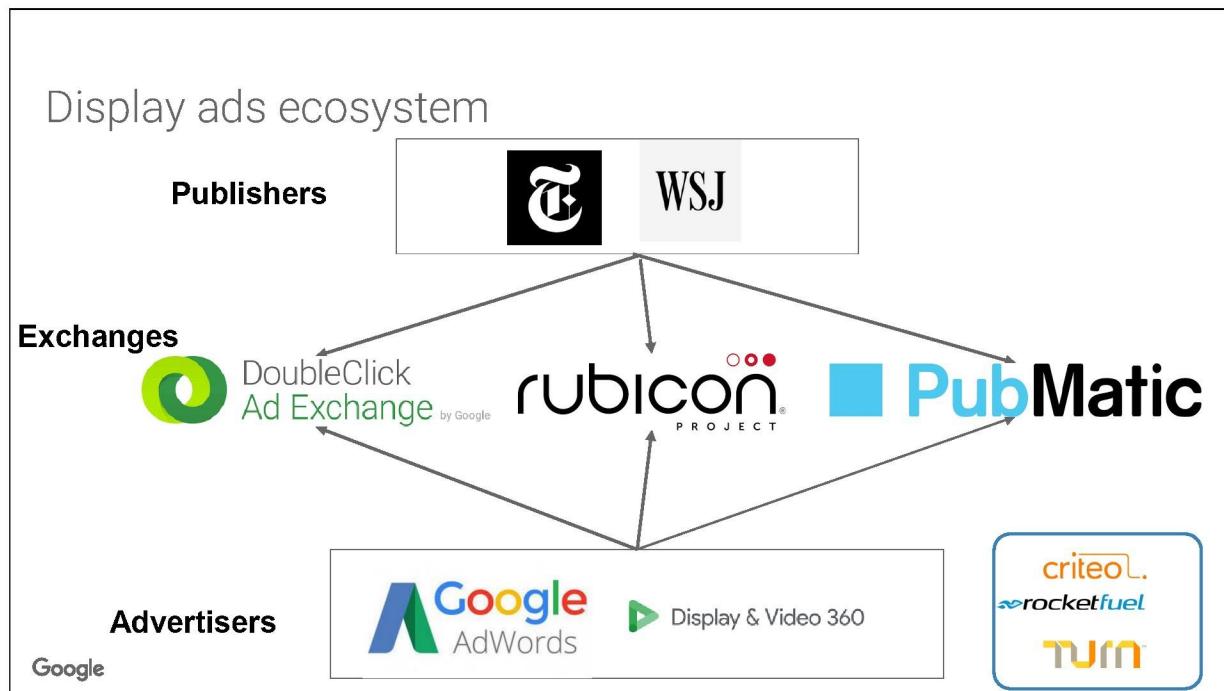


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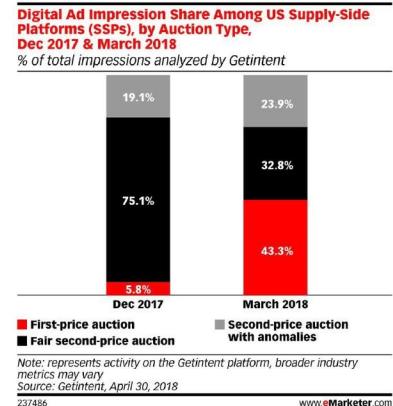
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Changing world of auctions

- Google has always been a strong proponent of second-price auctions (search ads, later AdSense, Adx, AdMob, ...)
- The outside world in the display ecosystem has moved further and further away from second pricing
- Adx (and Admob) is now moving for a first price auction in July
- We'll discuss the market (ecosystem) background, market direction, reason for Adx moving to first pricing, development of the 1p bidder,...



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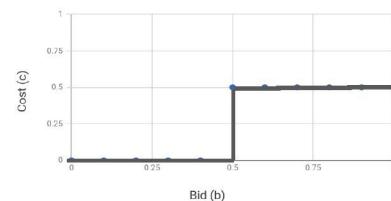
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Second price (2P) auctions

- Mechanism
 - Highest bidder wins
 - Pays max(runner-up bid, floor)
- Properties:
 - Incentive compatible (optimal bid = true value)
 - Maximizes welfare (allocates to buyers with highest values)
- Bidding
 - Trivial bidding if advertiser knows the value of click/imp
 - Non trivial for other advertisers
 - Auto bidding solutions such as HDMI.



Clean second price auction



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2P auctions

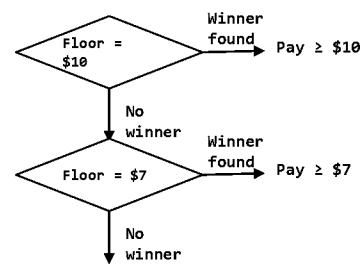
- Sellers: Exchanges are looking to exact more revenue but bridging the gap between winning bid and max(runnerup bid, floor)



- Reserve floor optimization (RPO)

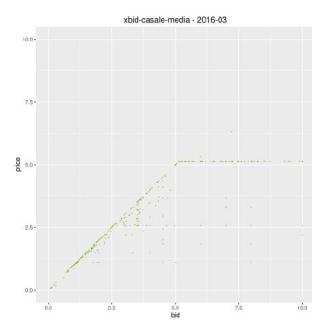
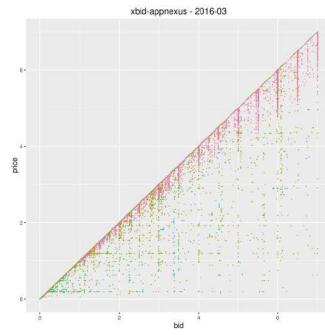
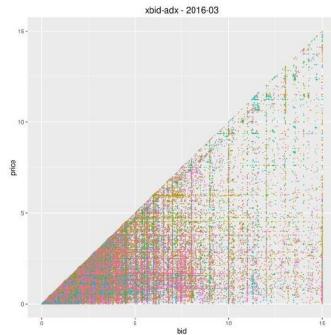
Modified 2P auctions: Third Party Exchanges (3PE)

- Multicall
 - Dutch auction
 - Increase latency for user



Modified 2P auctions: Third Party Exchanges (3PE)

- Untruthful auctions: Is auctioneer cheating?
 - Can buyers detect it?

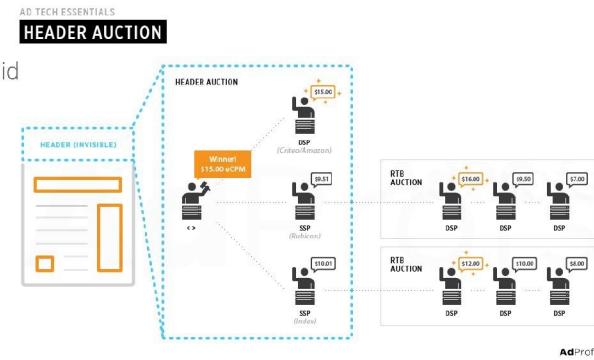


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Header Bidding

- Header bidding script
 - Get live bids from partners
 - AdServe calls winning partner with floor=bid
- Auction of Auctions
 - Header auction 1P
 - SSP auction 2P
 - First price bid = clearing price
 - Inefficient!
- SSP migrated to 1P auctions



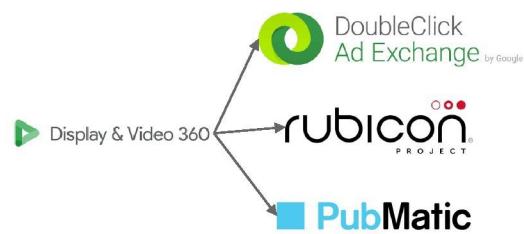
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Project Poirot

- Problem
 - DV360
 - Buys cross exchanges
 - Exchange neutral
 - 50% spend is MaxCPM
- Poirot
 1. **Detects & quantifies** deviations from 2P auctions
 2. **Optimizes bids** based on the input from framework in 1.



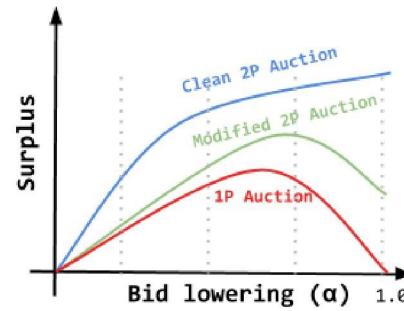
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Explore impact on surplus with bid shading

- Max $E[\text{surplus}]$
 - $E[\text{surplus}] = (\text{value}-\text{cost}) * P_{\text{win}}(\text{bid})$
- Optimal bid
 - Second price: bid = value
 - Others: bid shading i.e. bid < value
- Bid shading: bid = $\alpha * \text{value}$
 - $E[\text{surplus}(\alpha)] = (\text{value}-\text{cost}) * P_{\text{win}}(\alpha * \text{value})$
 - In truthful 2P auctions $\alpha=1$ max surplus
 - In 1P auction $\alpha=1$ gives zero surplus
 - Run background expts to measure surplus
 - Surplus = **sum(value - cost)** on all winning queries
 - Assumption: value = MaxCPM



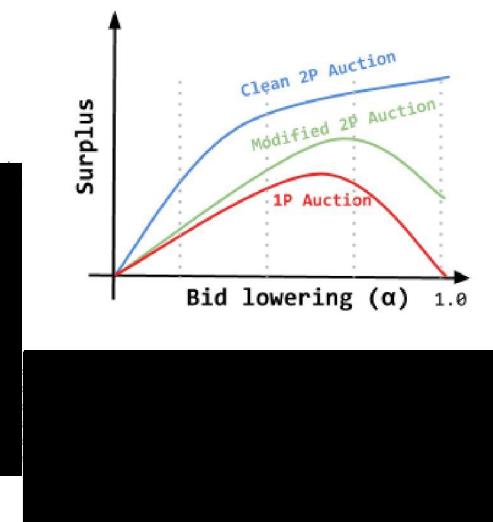
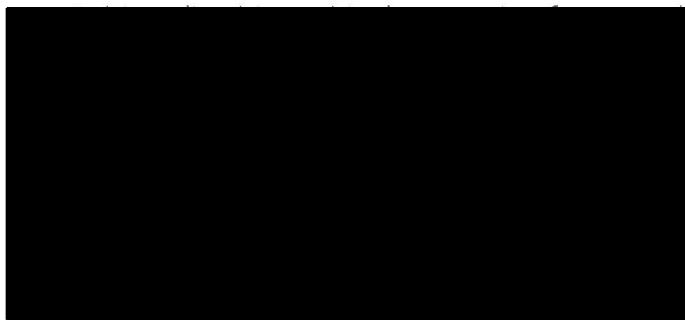
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Optimal bid shading

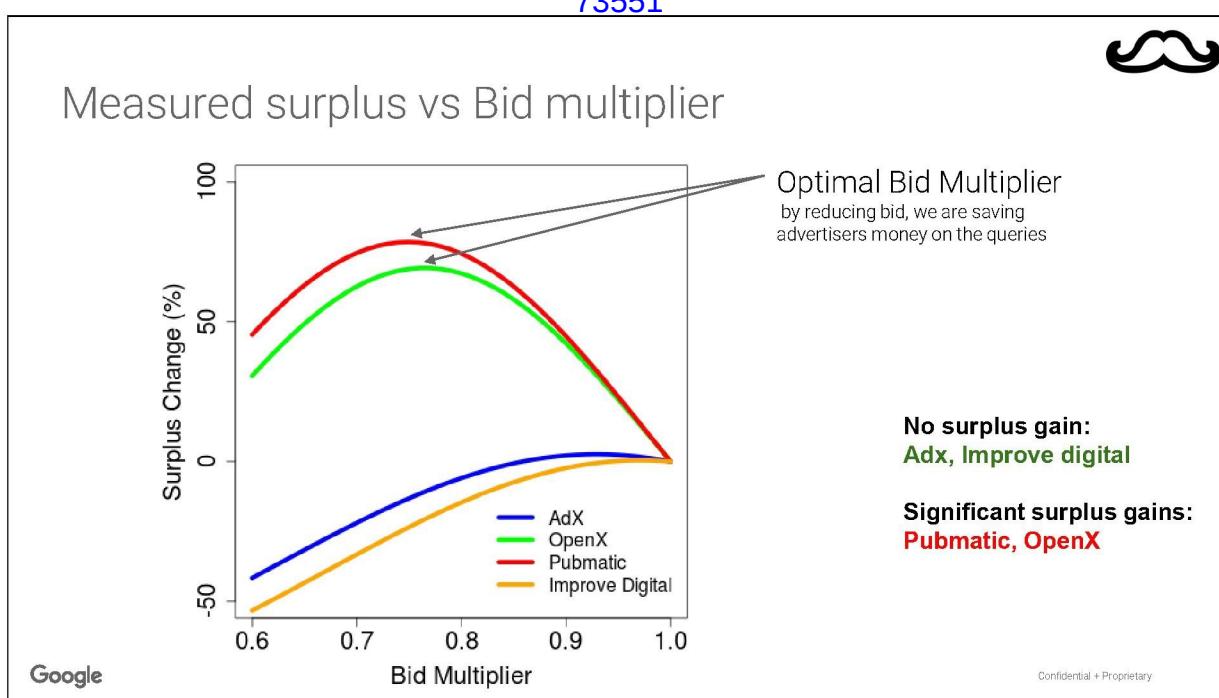
- Goal: Optimal bid shading for advertisers on different query segments.
- Model surplus as a function of bid shading.



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Measured surplus vs Bid multiplier



AdX announces move to Transparent 1P auctions

GOOGLE'S AD MANAGER WILL MOVE TO FIRST-PRICE AUCTION

The update will resonate across \$48 billion programmatic landscape

Google Switches To First-Price Auction

by Sarah Sluis // Wednesday, March 6th, 2019 – 5:33 pm

Share: [Twitter](#) [Facebook](#) [LinkedIn](#) [Email](#)

Google will move to first-price auctions for Google Ad Manager, its publisher exchange and ad server, by the end of 2019. At that time, it will also run a single, unified auction and remove last look, ceding a key advantage Google held in a second-price world.

Google Ad Manager will be the last major exchange to switch to first-price auctions. Other exchanges ~~tested or rolled out~~ first-price auctions starting in 2017.



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For most publishers, we have been running implicit first-price auctions for many years

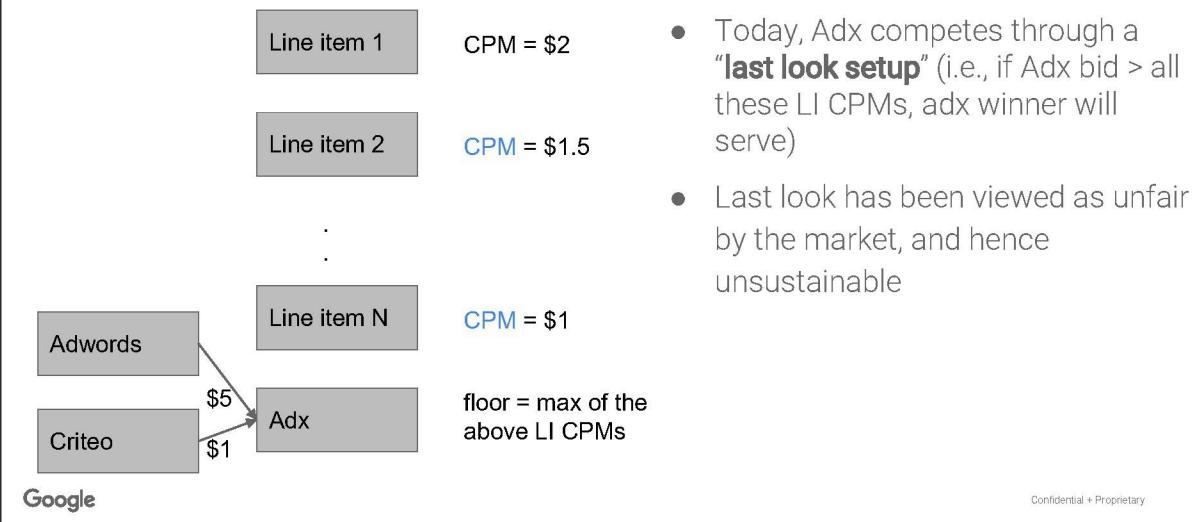
Line item 1	CPM = \$2
Line item 2	CPM = \$1.5
.	.
Line item N	CPM = \$1

- For every publisher using line items (including header bidding) in DFP, first price auction is already a reality
- Line items CPMs are based on the amount of money publishers expect to receive (akin to first price bids)

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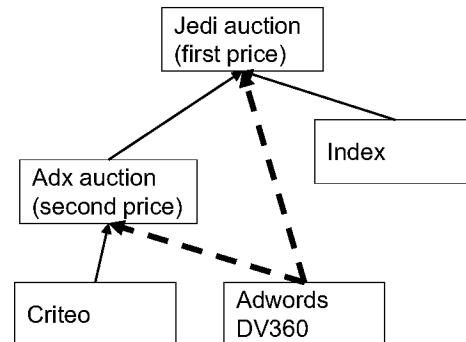
Adx competes in this implicit first price auction



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Move to exchange bidding (Jedi)

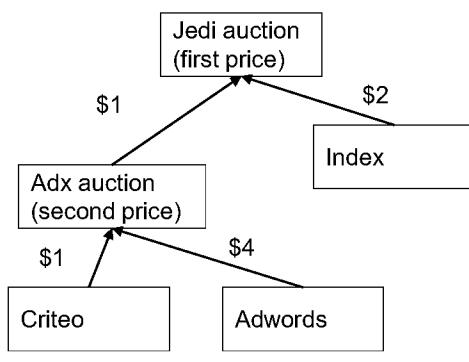
- Exchange bidding was designed as an explicit first price implementation that
 - Removes the sequential nature of the line-item auction
 - Compares live bids instead of expected bids
- Should we let buyers decide where to bid?
 - Buyside: yes, we would like to control our own destiny (i.e., control the final bid into the Jedi auction)
 - Sellside: no, because if GDN moves, the Adx auction collapses
- A compromise was to continue to keep last look for Adx



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But, we were forced to give up last look



- But, we were forced (by FAN and other players) to give up last look within a year of launching Jedi
- Adx needed to determine a bid to be compared with Index's bid in a first price auction
- The bid Adx uses is the second priced bid in the Adx auction
- Leads to scenarios where Adwords loses to EB buyers simply because the highest competitor's bid was not high enough!

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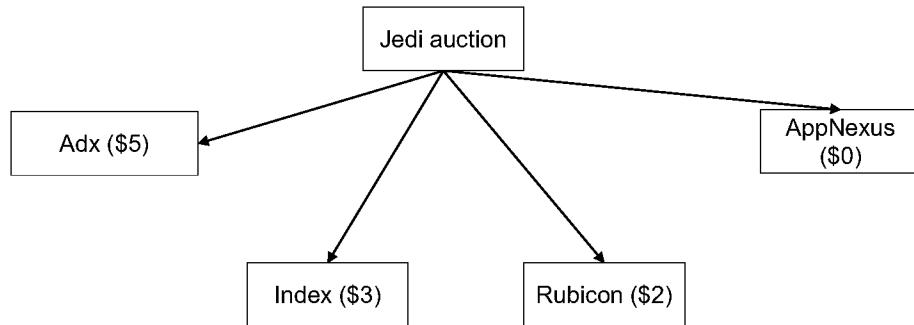
The current state is unsustainable

- The current setup put the buyers participating in the Adx auction in a competitive disadvantage when we gave up last look
- There is market pressure to give up last look even outside Jedi
- It is of paramount importance to let GDN and DBM to bid into the final first price auction
- What happens to the Adx second price auction when GDN and DBM move out of it?
 - The second-price path becomes very sparse, and whoever stays in this path will have a very small chance of winning the final auction
 - Sophisticated buyers like Criteo (who have already built the first price bidding technology to buy on 3PE) will follow suit.
 - Unsophisticated buyers will struggle and we need to decide what to do for them

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Publishers configure Adx floors to be high



A lot of the 3PE incrementality comes from this floors setup

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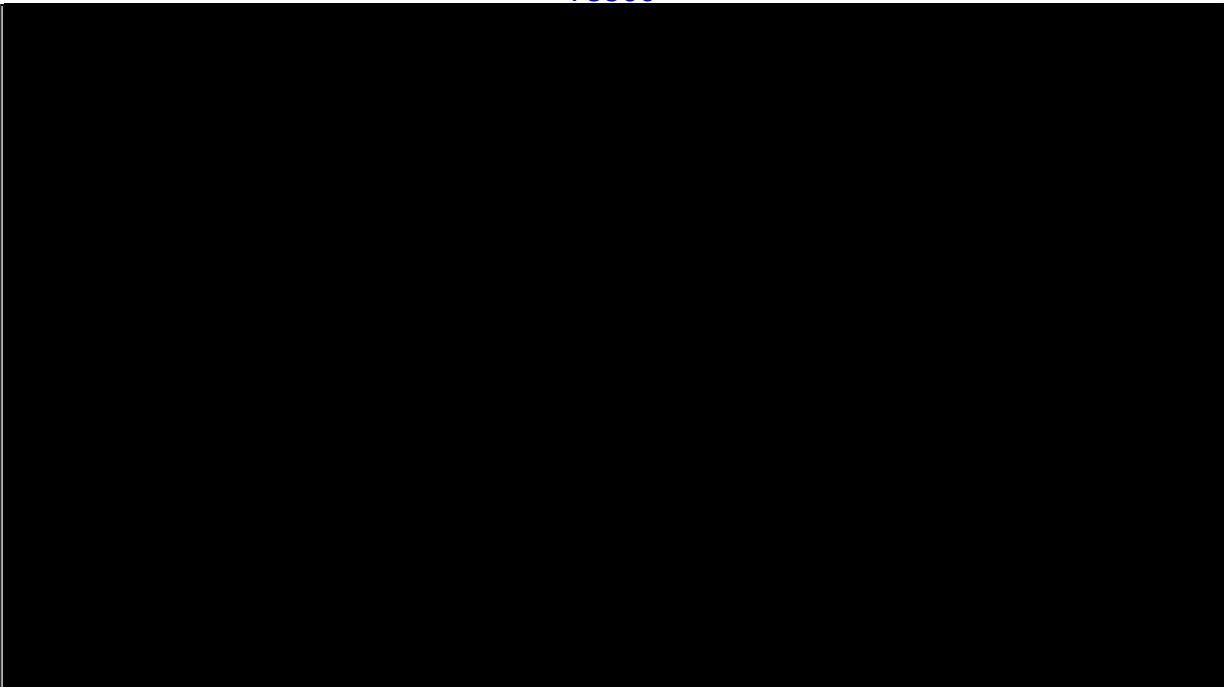
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AdX T1P (Transparent 1P) auction

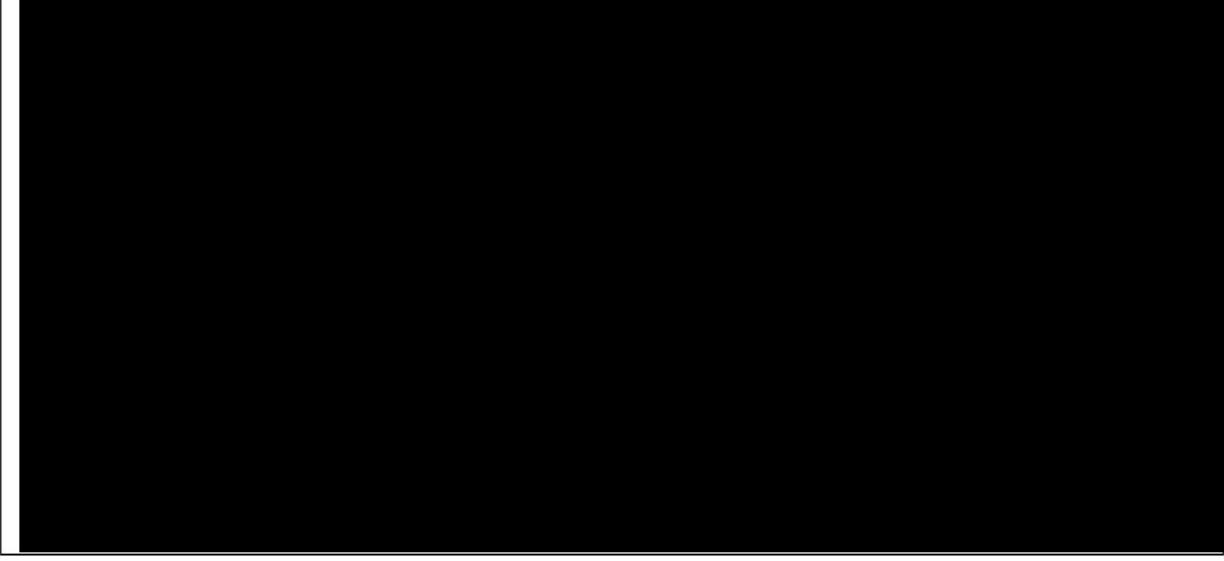
- Non transparent
 - Submit bids => Observe win or not.
- Transparent
 - Post auction every participant gets Highest Other Bid (HOB)
 - No need to run exploration experiments to build the competitive landscape
- Fair access
 - No buyer specific floors.
 - No last look

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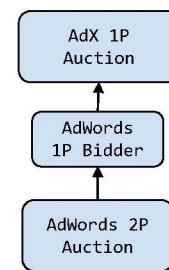


DV360: Bidding into transparent 1P auction



AdWords: Bidding into T1P auction

- AdWords internal auction: remains 2P
 - Advertisers & current auto bidding systems assume 2P auction
- Problem
 - Objective: Maximize $E[\text{surplus}]$
 - Constraints
 - $E[\text{payout}] = 0.85 * E[\text{revenue}]$ per publisher
 - Incentive compatible



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AdWords: Bidding into T1P auction

- 1P Bidder

- v_1 and v_2 : top 2 Adwords 2P bids
- 1p bid = $f(\alpha v_1, \text{CDF}_{\text{HOB}})$
 - f : max E[surplus]
 - α : chosen to hit buy side margin
- Cost = $\max(v_2, f^1(\text{HOB})/\alpha)$: min 2P bid to win since $v_1 > v_2$ and $f(\alpha v_1) > \text{HOB}$
- Properties
 - Incentive compatible
 - Maximizes welfare for given spend

Timelines and Status

- Timelines
- Status
 - DV360
 - Expts with optimal bidding based on lognormal model for pHOB
 - AdWords
 - Starting experiments

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